CLAIMS

1. A non-aqueous secondary battery which employs a negative electrode in which the negative electrode active material is a material capable of lithium doping/dedoping, a positive electrode in which the positive electrode active material is a lithium-containing transition metal oxide, and a non-aqueous electrolyte solution as the electrolyte solution, wherein

(1) the separator is composed of a porous film made of a porous polymer, which includes a network-like support, and swells in the electrolyte solution and retains said electrolyte solution,

(2) said network-like support has a mean film thickness of 10-30 μm, a basis weight of 6-20 g/m^2, a Gurley value (JIS P8117) of no greater than 10 sec/100 cc, a McMullin number of no greater than 10 at 25°C and a (McMullin number x film thickness) product of no greater than 200 μm.

(3) said separator has a mean film thickness of 10-35 μm, a basis weight of 10-25 g/m^2 and a Gurley value (JIS P8117) of no greater than 60 sec/100 cc, and

(4) the following relationship:

$$QprWp < qm + QnWn < 1.3QpWp \qquad I$$

is satisfied, wherein the value of the total amount of lithium in the positive electrode active material in terms of electric charge is Qp (mAh/mg), the amount of lithium utilized for charge-discharge reaction of the lithium in the positive electrode active material in terms of electric charge is Qpr (mAh/mg), the value of the amount of lithium which can be doped in the negative electrode active material in terms of electric charge is Qn (mAh/mg), the value for the overcharge-preventing function of the separator is qm (mAh/cm^2), the weight of the positive electrode active material is Wp (mg/cm^2) and the weight of the negative electrode active material is Wn (mg/cm^2).

2. A battery according to claim 1, wherein QprWp/QnWn = 0.7-1.05.

3. A battery according to claim 1, wherein said positive electrode active material is a lithium-containing transition metal oxide represented by $LiMO_2$, where M is at least one metal element selected from the group consisting of cobalt, nickel, manganese, aluminum, iron, titanium and vanadium, and at least 1/3 of the atomic ratio composition of M is cobalt or nickel.

4. A battery according to claim 1, wherein said positive electrode active material is a lithium-containing transition metal oxide represented by LiM_2O_4 where M is at least one metal element selected from the group consisting of manganese, magnesium, nickel, cobalt, chromium, copper, iron and boron, and at least 1/3 of the atomic ratio composition of M is manganese.

5. A battery according to claim 1, wherein said positive electrode active material is lithium nickelate ($LiNiO_2$).

6. A battery according to claim 1, wherein said positive electrode active material is lithium manganate ($LiMn_2O_4$).

7. A battery according to claim 1, wherein said positive electrode active material is composed of lithium manganate ($LiMn_2O_4$) and lithium nickelate ($LiNiO_2$).

8. A battery according to claim 1, wherein said network-like support is a nonwoven fabric.

9. A battery according to claim 8, wherein the fiber composing said nonwoven fabric is composed of at least one type of high-molecular-weight polymer selected from the group consisting of polyolefins, polyphenylene sulfide, aromatic polyamides and polyesters.

10. A battery according to claim 1, wherein said network-like support is a cloth.

11. A battery according to claim 10, wherein said network-like support is a glass cloth.

12. A battery according to any one of claims 1 to

11, wherein the overcharge-preventing function value qm of said separator is in the range of 0.1-1.5 mAh/cm^2.

13. A battery according to claim 12, wherein the overcharge-preventing function value qm of said separator is in the range of 0.1-1.0 mAh/cm^2.

14. A non-aqueous secondary battery which employs a negative electrode in which the negative electrode active material is a material capable of lithium doping/dedoping, a positive electrode in which the positive electrode active material is a lithium-containing transition metal oxide, and a non-aqueous electrolyte solution as the electrolyte solution, wherein

(1) the separator is composed of a porous film made of a porous polymer, which includes a network-like support, swells in the electrolyte solution and retains said electrolyte solution,

(2) said network-like support has a mean film thickness of 10-30 μm, a basis weight of 6-20 g/m^2, a Gurley value (JIS P8117) of no greater than 10 sec/100 cc, a McMullin number of no greater than 10 at 25°C and a (McMullin number x mean film thickness) product of no greater than 200 μm.

(3) said separator has a mean film thickness of 10-35 μm, a basis weight of 10-25 g/m^2 and a Gurley value (JIS P8117) exceeding 60 sec/100 cc and no greater than 500 sec/100 cc, and

(4) the following relationship:

$$QprWp < qm + QnWn < 1.3QpWp \qquad I$$

is satisfied, wherein the value of the total amount of lithium in the positive electrode active material in terms of electric charge is Qp (mAh/mg), the amount of lithium utilized for charge-discharge reaction of the lithium in the positive electrode active material in terms of electric charge is Qpr (mAh/mg), the value of the amount of lithium which can be doped in the negative electrode active material in terms of electric charge is

Qn (mAh/mg), the value for the overcharge-preventing function of the separator is qm (mAh/cm^2), the weight of the positive electrode active material is Wp (mg/cm^2) and the weight of the negative electrode active material is Wn (mg/cm^2).

15. A battery according to claim 14, wherein QprWp/QnWn = 1.05-4.0.

16. A battery according to claim 14, wherein said positive electrode active material is a lithium-containing transition metal oxide represented by $LiMO_2$, where M is at least one metal element selected from the group consisting of cobalt, nickel, manganese, aluminum, iron, titanium and vanadium, and at least 1/3 of the atomic ratio composition of M is cobalt or nickel.

17. A battery according to claim 14, wherein said positive electrode active material is a lithium-containing transition metal oxide represented by LiM_2O_4 where M is at least one metal element selected from the group consisting of manganese, magnesium, nickel, cobalt, chromium, copper, iron and boron, and at least 1/3 of the atomic ratio composition of M is manganese.

18. A battery according to claim 14, wherein said positive electrode active material is lithium nickelate ($LiNiO_2$).

19. A battery according to claim 14, wherein said positive electrode active material is lithium manganate ($LiMn_2O_4$).

20. A battery according to claim 14, wherein said positive electrode active material is composed of lithium manganate ($LiMn_2O_4$) and lithium nickelate ($LiNiO_2$).

21. A battery according to claim 14, wherein said network-like support is a nonwoven fabric.

22. A battery according to claim 21, wherein the fiber composing said nonwoven fabric is composed of at least one type of high-molecular-weight polymer selected from the group consisting of polyolefins, polyphenylene sulfide, aromatic polyamides and polyesters.

23. A battery according to claim 14, wherein said network-like support is a cloth.

24. A battery according to claim 23, wherein said network-like support is a glass cloth.

25. A battery according to any one of 14. to 24, wherein the overcharge-preventing function value qm of said separator is in the range of 1.0-5.0 mAh/cm^2.

26. A battery according to claim 25, wherein the overcharge-preventing function value qm of said separator is in the range of 1.5-3.0 mAh/cm^2.

27. A battery separator composed of a porous film made of a polymer, which includes a network-like support, and swells in the electrolyte solution and retains said electrolyte solution, wherein said network-like support has a mean film thickness of 10-30 μm, a basis weight of 6-20 g/m^2, a Gurley value (JIS P8117) of no greater than 10 sec/100 cc, a McMullin number of no greater than 10 at 25°C and a (McMullin number x mean film thickness) product of no greater than 200 μm, and said porous film has a mean film thickness of 10-35 μm, a basis weight of 10-25 g/m^2 and a Gurley value (JIS P8117) exceeding 60 sec/100 cc and no greater than 500 sec/100 cc.

28. A separator according to claim 27, wherein said network-like support is a nonwoven fabric.

29. A separator according to claim 28, wherein the fiber composing said nonwoven fabric is composed of at least one type of high-molecular-weight polymer selected from the group consisting of polyolefins, polyphenylene sulfide, aromatic polyamides and polyesters.

30. A separator according to claim 27, wherein said network-like support is a cloth.

31. A separator according to claim 30, wherein said network-like support is a glass cloth.

32. A separator according to claim 27 above, wherein said organic polymer is polyvinylidene fluoride (PVdF), a PVdF copolymer or a compound composed mainly of

PVdF.